[P03.053] Neuroanatomy of Impaired Empathy in Frontotemporal Dementia

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OBJECTIVE: To delineate the patterns of brain atrophy associated with impaired capacity for empathic response in frontotemporal dementia (FTD) patients.
BACKGROUND: Emotional dysregulation and altered social behavior are early hallmarks of FTD. One aspect of this emotional impairment is loss of interpersonal empathy, which is commonly observed in both frontal and temporal FTD subtypes. Studies in other clinical populations suggest that damage to the orbitofrontal cortex, right temporal lobe, and/or the amygdala may result in diminished empathy. The right superior temporal gyrus (STG), middle temporal gyrus (MTG), and fusiform gyrus (FG) have all been associated with interpretation of social/emotional stimuli such as facial expression and voice prosody. However, the neuroanatomical substrates of diminished empathy have yet to be quantified in FTD, partly because sample sizes are typically limited. We hypothesized that the capacity for empathy would be positively correlated with right ventromedial orbitofrontal cortex (VMOC), right temporal lobe, and right amygdala volume.
DESIGN/METHODS: Thirty-one patients meeting the Neary criteria for any of the 3 subtypes of FTD (Semantic Dementia, FTD, or Progressive Aphasia) were examined. First-degree relatives rated patients using the Interpersonal Reactivity Index (IRI), a psychometrically validated questionnaire measure examining both cognitive and emotional components of empathy. All patients underwent structural MRI scanning, and their T1-weighted MP-RAGE images were analyzed using the optimized voxel-based morphometry technique in SPM-99. Brain volumes were analyzed using IRI scores as a covariate of interest controlling for age and sex.
RESULTS: The three brain areas showing the most significant ($p<0.001$) positive association with cognitive empathy (as measured together by the Perspective Taking and Fantasy subscales of the IRI) were the posterior aspect of the right MTG, the VMOC (right>left), and the inferior aspect of the right STG. Emotional empathy (measured by the Emotional Concern subscale of the IRI) was positively associated ($p<0.001$) with the posterior aspect of the right FG and the anterior aspect of the right inferior temporal gyrus, but there was no significant relationship between emotional empathy and the VMOC. Amygdala volume was not significantly related to cognitive or emotional empathy.
CONCLUSIONS: This atrophy-based model of brain-behavior relationships suggests that the right temporal lobe contributes independently to FTD patients' capacity for empathy, beyond the role of the amygdala in emotion processing. The superior structures in the right temporal lobe appear to mediate the cognitive aspects of empathy, while emotional empathy may be mediated by more infero-medial structures in the right temporal lobe. Also, though the right VMOC was strongly correlated with cognitive empathy, it showed no relationship with emotional empathy in these patients.

Category - Behavioral Neurology
SubCategory - Neuropsychiatry/Emotion